March 23, 1965 T. E. BRIDGEWATER 3,174,697

IMPELLER

Filed July 30, 1962 2 Sheets-Sheet 1

Fig. 1.

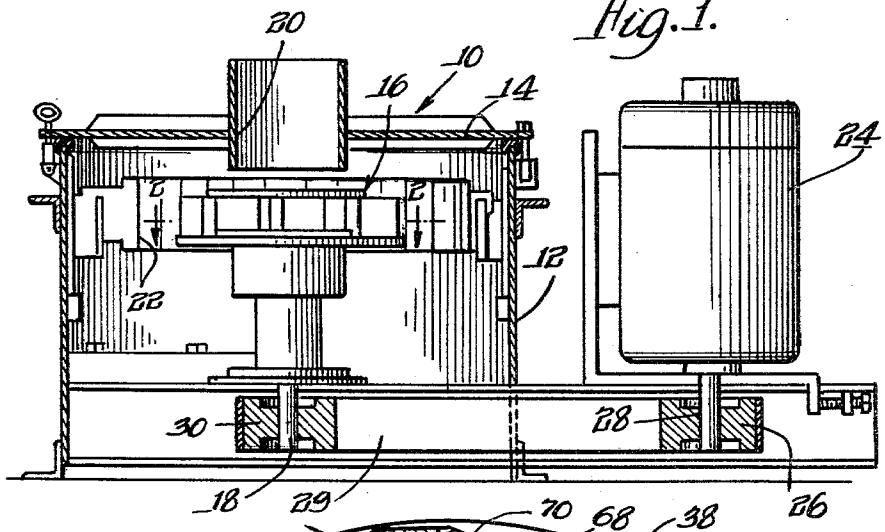

Fig. 2.

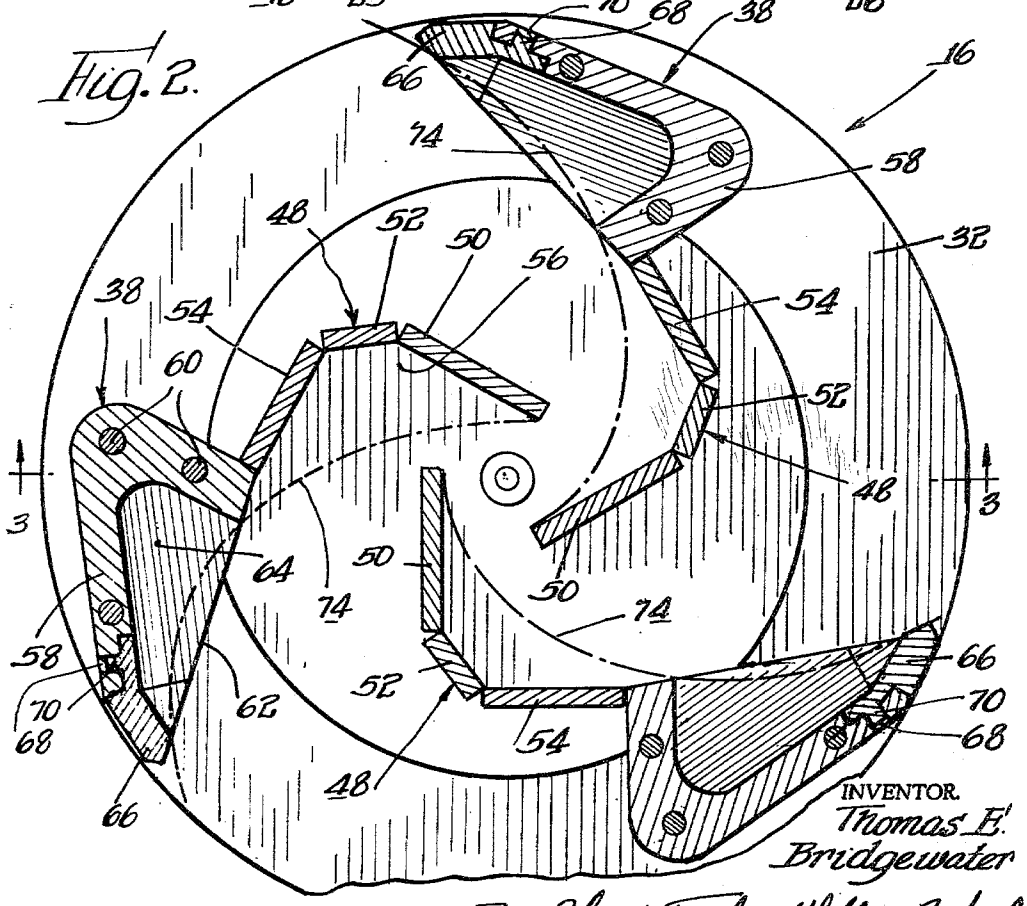

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Fig. 3.

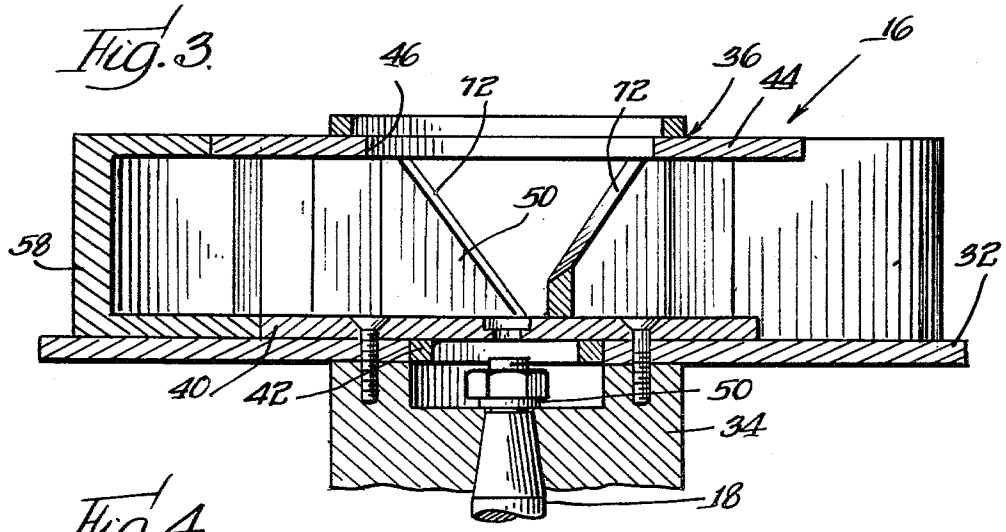


Fig. 4.

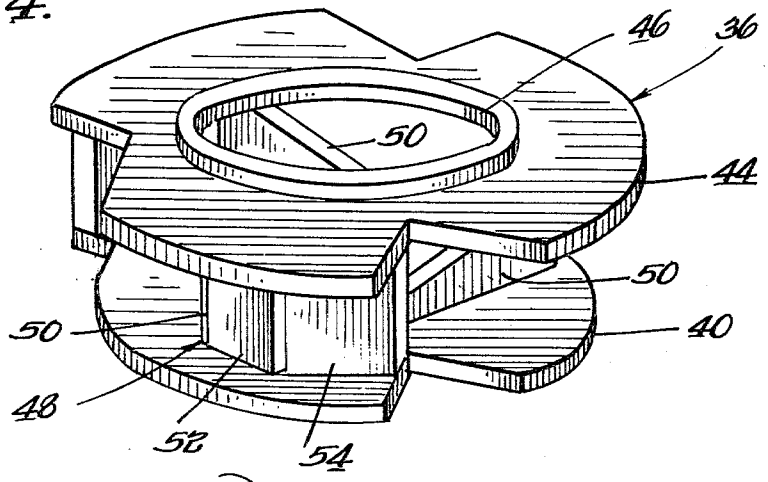
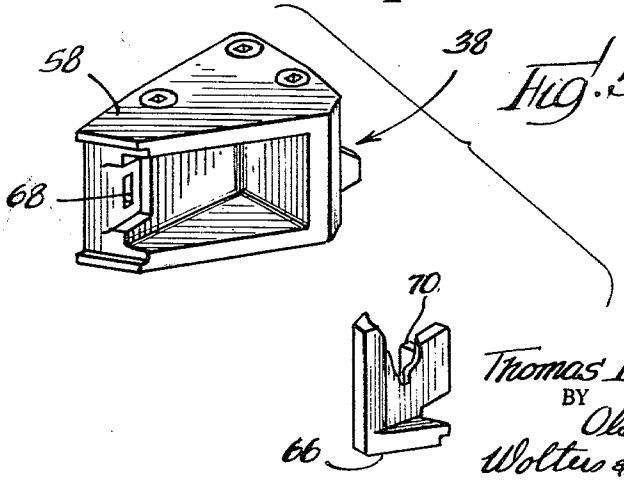


Fig. 5.



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United States Patent Office 3,174,697
Patented Mar. 23, 1965

3,174,697

IMPELLER

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Filed July 30, 1962, Ser. No. 213,369
2 Claims. (Cl. 241—275)

The present invention relates to a novel crushing apparatus and more particularly to a novel impact crushing apparatus.

An impact crusher of the type contemplated herein includes an upstanding impeller structure onto which material being processed is deposited and which is adapted to accelerate the material and project the material laterally outwardly for engagement with breaker plate means arranged around the impeller. The efficiency of the apparatus is, in part, determined by the degree to which the impeller is capable of accelerating the material for projecting the material against the breaker plate means with a high impact velocity. In addition the overall efficiency of the apparatus is affected by the maintenance requirements of the impeller structure.

An important object of the present invention is to provide an impact type crushing apparatus having a novel impeller structure which is constructed for minimizing maintenance costs and for more effectively accelerating material being processed whereby to improve the overall efficiency of the apparatus.

Other objects and advantages of the present invention will become apparent from the following description and the accompanying drawings wherein:

FIG. 1 is a simplified partial vertical sectional view showing an apparatus incorporating features of the present invention;

FIG. 2 is an enlarged sectional view taken along line 2—2 in FIG. 1;

FIG. 3 is a fragmentary sectional view taken along line 3—3 in FIG. 2;

FIG. 4 is a perspective view showing a portion of the novel impeller structure of the invention; and

FIG. 5 is an exploded perspective view showing an impeller shoe constructed in accordance with features of the present invention.

Referring now more specifically to the drawings wherein like parts are designated by the same numerals throughout the various figures, a crushing apparatus **10** incorporating features of the present invention is shown in FIG. 1. The apparatus comprises an upstanding cylindrical housing or shell **12** having a cover **14** removably disposed thereon. An impeller structure **16** incorporating features of the present invention is mounted on an impeller shaft **18** suitably supported centrally within the housing **12** for rotation about a substantially vertical axis. The impeller which will be described in detail below is adapted to engage material delivered through an opening **20** in the cover **14** and accelerate such material and throw the material laterally outwardly for engagement against breaker plates **22** mounted around the interior of the housing **12**. As will be understood, the desired breaking action occurs upon impact of the material being processed against the breaker plates **22**.

In order to drive the impeller, an electric motor or other suitable prime mover **24** is mounted adjacent the housing **12**. A drive pulley **26** is secured to an output shaft **28** of the motor for driving an endless belt **29** which in turn encircles and drives the pulley **30** secured to the lower end of the impeller shaft **18**.

As shown best in FIGS. 2 and 3, the impeller **16** comprises a horizontal disk **32** suitably secured to a hub member **34** mounted on an upper end portion of the impeller shaft **18**. A central distributor unit **36** is

mounted on the impeller plate **32** for receiving material to be processed directed through the opening **20** and initially accelerating and directing the material outwardly. In addition impeller blade units **38** are mounted on and spaced around the disk **32** for further accelerating the material to be processed and projecting such material outwardly for impingement against the breaker plates **22**.

As shown in FIGS. 2, 3 and 4, the distributor unit **36** comprises a lower or base disk **40** disposed on the impeller disk **32** and having a ring **42** welded to its lower side for projecting into an aperture in the impeller disk and positively centrally locating the distributor unit with respect to the impeller disk. The distributor unit also includes an upper annular disk **44** spaced vertically above the base disk **40** and having a central opening **46** therein through which material from the inlet opening **20** is adapted to fall. Blade means **48** are secured between and spaced around the disks **40** and **44**. These blade means may be welded or otherwise secured to the plate members **40** and **44** so that the central distributor structure **36** may be handled and removed and replaced as a unit.

In the embodiment shown, each of the blade means **48** includes a first upstanding plate member **50** which is generally parallel to and offset rearwardly with respect to the direction of rotation of the impeller from a vertical plane containing the axis of rotation of the impeller structure. In addition each of the blade means includes an intermediate upstanding plate member or section **52** extending from the outer end of the plate member **50** and inclined forwardly therefrom. The outer end edge of each of the intermediate sections **52** substantially abuts an edge of an additional or outer plate member **54** which extends forwardly at a greater angle and is preferably substantially perpendicular to the aforementioned plane as shown best in FIG. 2. Thus each of the blade means **48** defines a forwardly facing pocket **56** which is adapted to be filled with particles of the material being processed as will be described more in detail below.

Each of the blade units **38** comprises a main body member **58** shown best in FIGS. 2, 3 and 5, which body member is detachably secured to the impeller disk **32** by means of a plurality of bolts **60**. Each body member **58** is mounted so that its forward side **62** extends from and substantially provides a continuation of an adjacent blade element **54** and is preferably even slightly inclined forwardly of the adjacent blade element **54** as shown in FIG. 2. Each body member **58** also defines a forwardly facing pocket **64** which is adapted to become filled with particles of material being processed for protecting the body member against direct abrasion by the material during a crushing operation. In the embodiments shown each blade unit **38** also includes an insert **66** detachably connected with the main body member **58**.

In order detachably to connect the insert **66** with the body member **58**, an aperture **68** is formed in the body member **58** for receiving a tongue **70** formed integrally with the insert **66**. The aperture **68** and the tongue **70** extend diagonally outwardly and rearwardly with respect to an intersecting radius of the impeller so that during rotation of the impeller, centrifugal force urges the tongue **70** agressively into the aperture **68** and precludes accidental disassembly of the insert.

In the embodiments shown, each insert **66** is adapted to overlie and completely cover the outer end margin of its associated body member **58** and thus provide the outer terminal end of its blade unit. This outer end is usually subjected to the greatest amount of abrasion and wear during a crushing operation whereby each insert will usually be worn away faster than its associated body member **58**. It is contemplated that the inserts **66** may be quickly and easily removed and replaced independently

of their associated body members **58** whereby to reduce maintenance costs.

During a crushing operation, material to be processed is delivered through the opening **20** in the cover **14** and falls downwardly through the opening **46** in the distributor plate **44** and is first engaged by the elements **50** of the blade means **48**. As shown best in FIG. 3, inner edges **72** of the elements **50** are beveled whereby the elements **50** are relieved and provided with a generally triangular configuration for minimizing any possibility of the material becoming jammed and clogging the central area within the distributor unit **36**. As additional material is delivered to the impeller, the pockets **56** and **64** become filled and packed with particles of the material so that such packed material provides surfaces **74** indicated by broken lines in FIG. 2 over which subsequent particles of the material being processed pass as they are accelerated and thrown from the impeller. In accordance with a feature of the present invention, the blade means **48** and the impeller blade units **38** are constructed and angularly disposed in the manner previously described and for arranging the pockets **56** and **64** in a manner which promotes filling and packing of the pockets and the forming of the surfaces **74** with a substantially predetermined configuration. When the pockets **56** and **64** are filled with the material, the elements of the blade means **48** and the blade unit **38** are effectively protected against direct engagement and abrasion by a majority of the material which is processed. Furthermore the surfaces **74** are formed with a curving configuration which progressively increases in curvature from the radially inner ends of the blade means toward the radially outer ends of the blade unit. When the surfaces **74** are formed in this manner, an optimum condition is approached whereby the material being processed readily flows outwardly across the surfaces **74** and at the same time is retained in engagement with the surfaces **74** for a longer period. As a result the particles of the material being processed are accelerated more efficiently to higher velocities at the time of departure from the periphery of the impeller whereby to promote a more effective crushing action.

While the preferred embodiment of the present invention has been shown and described herein, it is obvious that many details may be changed without departing from the spirit and scope of the appended claims.

The invention is claimed as follows:

1. An impeller, of the type described, which is rotatable in a predetermined direction about an upstanding axis comprising vertically spaced and substantially axially aligned generally flat lower and upper disc members, said upper disc member having a central opening therein through which material to be processed may be delivered, a plurality of blade means disposed between said disc members and spaced therearound, each of said blade means defining a forwardly facing pocket for receiving and retaining a portion of material being processed and extending from adjacent said axis radially outwardly and forwardly with respect to said predetermined direction of rotation, a third disc member beneath and supporting said lower disc member and having portions extending radially outwardly of said lower disc member, a plurality of separate and individually mounted shoe means having forwardly facing pockets on said radially extending portions of said third disc member and respectively disposed for providing outer end extensions of said blade means, each of said shoe means including a main body member extending outwardly and substantially forwardly with respect to said direction of rotation, and an insert substantially covering an outer end of said main body member, said insert and said main body member including complementary tongue and aperture means interengaging each other and extending generally radially for releasably connecting the insert with said main body member.

2. An impeller structure, of the type described, which is rotatable in a predetermined direction about an upstanding axis comprising vertically spaced and substantially axially aligned generally flat lower and upper disc members, said upper disc member having a central opening therein through which material to be processed may be delivered, a plurality of blade means disposed between said disc members and spaced therearound, each of said blade means defining a forwardly facing pocket for receiving and retaining a portion of material being processed and extending from adjacent said axis radially outwardly and forwardly with respect to said predetermined direction of rotation, a third disc member beneath and supporting said lower disc member and having portions extending radially outwardly of said lower disc member, a plurality of separate and individually mounted shoe means having forwardly facing pockets on said radially extending portions of said third disc member and respectively disposed for providing outer end extensions of said blade means, each of said blade means including an inner end section on said lower disc member and inwardly of an inner margin of said upper disc member for direct engagement with material to be processed entering through said central opening, and each of said inner end sections having an upper edge extending generally diagonally downwardly from adjacent said inner margin of said upper disc member toward an inner terminal end of the end section.

References Cited in the file of this patent

UNITED STATES PATENTS

2,992,783 Wirth et al. ---------- July 18, 1961

FOREIGN PATENTS

688,169 Germany ---------- Feb. 14, 1940